Connecting the Dots: Using Social Network Analysis to Untangle the Factors Driving International Migration

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Abstract: Numerous case studies have analyzed the factors that cause people to move between specific countries or within certain regions of the world. However, empirical research has yet to consider whether theories of international migration can be generalized to a global scale. While making generalizations about the global system of international migration raises unique methodological challenges, I argue that these can be alleviated through adopting a social network perspective. In the current project, I model the patterns of international migration as a social network where actors are individual countries who are tied together by flows of migrants. Then, I apply methods from statistical network analysis to simultaneously test five theories of international migration. While I find modest support for theories of neoclassical economics and the new economics of labor, I uncover convincing evidence that social capital theory can be generalized to explain patterns of international migration of a global scale.

Introduction

Social scientists and policy makers have long debated what causes people to move from one country to another. There are multiple theories that attempt to make sense of international migration and these perspectives have been rigorously tested in empirical research. However, almost all of this work focuses on unidirectional migration streams between two countries of

interest (e.g., Flores-Yeffal and Pren 2018; Garip, 2017; Massey and España, 1987; Massey and Espinosa, 1997) or specific areas of the world (e.g., Constant and Massey 2002; Pedersen, Pytlikova, and Smith, 2008; Ricketts, 1987). While these case studies have proved to be informative, it remains unclear whether contemporary theories of international migration can be generalized to a global scale (Levitt and Jaworksy, 2007).

Part of the reason research has yet to test the generalizability of these theories is that, until recently, we have lacked the appropriate methods. In addition to needing detailed data on migration flows between each pair of countries, making such generalizations requires the methodological capacity to conceptualize countries as simultaneous senders and receivers of migrants. However, since most traditional statistical methods rely on the assumption that all observations are independent, it is often impossible to account for the inherent interdependence that characterizes the global movement of people. As a result, I argue that researchers can gain valuable insight about the forces that drive international migration by modeling these patterns as a social network. By recognizing that international migration is a social process that embeds all countries in a complex, interrelated system, we can better understand how individual immigrants calculate their decisions to move internationally.

In the current project, I further disentangle the factors that drive international migration by applying a social network perspective to study global migration flows. I use novel data on migrant flows between 200 countries from 2010 to 2015 (Abel, 2017) and conceptualize this data as a social network. In my network, actors represent individual countries that are tied together by weighted edges, where the value of each weight represents the number of people who migrated between that pair of countries during a given time frame. Using methods from statistical network analysis, I rigorously test the generalizability of five contemporary theories of international

migration, including neoclassical economics, the new economics of labor migration, segmented labor markets, world systems, and social capital perspectives. By understanding what causes individuals to internationally migrate, we can construct policies that are more effective and better attend to the needs of all migrant groups.

Background

Why Do People Internationally Migrate?

Over the past several decades, migration scholars have posed a variety of theories to explain why people decide to internationally migrate, including neoclassical economics, new economics of labor migration, segmented labor markets, world systems, and social capital theory. While some tenets of the five theories complement one another, other aspects suggest competing hypotheses. As a result, previous work argues that there is value in using a coherent analytical framework to test these migration theories against one another (Garip, 2017; Massey and Espinosa, 1997).

First, theories of neoclassical economics argue that individuals calculate cost-benefit analyses when deciding whether or not to migrate (Todaro, 1969; Todaro, 1980). If an individual perceives that he or she will earn higher wages in a destination country – after accounting for the odds of finding employment and cost of migrating – the individual will rationally decide to emigrate from their origin country (Harris and Todaro, 1970; Todaro and Maruszko, 1987). According to this perspective, we should expect to see the highest levels of migration between countries where individuals tend to earn very little and those where residents enjoy relative financial success and job opportunities are plentiful. Previous empirical work finds modest support for the neoclassical model. For instance, El Salvadorian migrants are less likely to move

to the United States when American unemployment levels are high (Flores-Yeffal and Pren, 2018). However, Massey and Espinosa (1997) find that, at the end of the twentieth century, differentials in expected wages did not play a major role in explaining the fluctuation of migration from Mexico to the United States. Similarly, differences in per capita Gross Domestic Product (GDP) have not consistently predicted variations in the flow of migrants from Poland to Germany since the 1980s (Massey, Kalter, and Pren, 2008).

The new economics of labor migration emerged in response to the inconsistencies of the neoclassical model. This perspective argues that when individuals decide to migrate, they consider both their immediate and long-term economic needs, as well as those of their households (Stark and Bloom, 1985). Since people migrate as a strategy to diversify their economic risks and gain access to capital, countries with volatile markets and growing economies are more likely to send migrants (Katz and Stark, 1986). According to the new economics theory, high economic volatility, credit shortages, and rising inflation and interest rates should lead to a surge in emigration from the country of interest. For instance, previous work finds when interest and inflation rates increase, greater numbers of Mexicans migrate to the Unites States (Garip, 2017; Massey and Espinosa, 1997).

While segmented labor market and world systems theories also primarily focus on the macroeconomic factors that drive international migration, these perspectives further consider how structural forces and inequality shape individuals' migration decisions. Segmented labor market theory argues that the advancement of industrialized countries is accompanied by a demand for international migrants to the fill temporary labor shortages (Piore, 1979). Previous work has used the annual rate of growth in the employment levels of receiving countries to test segmented labor market theory, typically finding modest support for perspective (e.g., Frisbie,

1975; Garip, 2017; Massey and Espinosa, 1997). World systems theory points to the globalization of the market economy as being the primary driver of international migration (Sassen, 1988). Specifically, this theory hypothesizes that as countries receive more direct foreign investments, particularly those that are capital-intensive, residents will lose jobs and emigration to highly industrialized countries will increase. Empirical evidence for world systems theory, however, has received limited support (e.g., Garip, 2017; Ricketts, 1987; Massey and Espinosa, 1997).

Finally, social capital theory emphasizes the importance of relational ties (Massey and España, 1987). Individuals are more likely to immigrate if they have family, friends, or other personal connections in the destination country of interest because such social ties encourage the flow of information and decrease social costs (Massey and España, 1987; Palloni et al., 2001). Furthermore, having social ties in receiving societies decreases ones odds of emigrating back to their origin country (Van Hook and Zhang, 2011). While theories regarding social capital are best tested with individual-level data, it is also possible to test these theories at more aggregate levels. For instance, if social capital theories are supported, individuals will be more likely to migrate to destination countries where large numbers of co-nationals already reside.

Applying a Social Network Perspective to the Study of International Migration

While researchers are beginning to apply a social network perspective to study the social process that surround migration (Bilecen, Gamper, and Lubbers, 2018; McMillan, 2018; Verdery et al., 2018), almost no previous scholarship uses social network analysis to study international migration flows (see Windzio (2018) for an exception). However, there are several reasons why adopting a network approach can help untangle the factors that drive global migration. Most

importantly, international migration represents a highly interconnected social system. A network perspective highlights the intrinsic connectivity of the migration network and allows us to simultaneously study countries as both senders and receivers of migrants. Furthermore, social network analysis helps us move beyond conceptualizing our unit of analysis as individual countries and instead enables us to focus on the flows of migrants that connect different sending and receiving communities.

More technically, there are two key methodological benefits of applying social network analysis to the study of international migration. First, unlike traditional statistical models, advances in statistical social network analysis allow us to relax the assumption that all cases are independent. This relaxation is crucial since data on international migration flows are inherently interdependent. To illustrate this dependence with an example, consider the following two migration flows: the flow of migrants from India to the United States and the flow of migrants from India to the United Kingdom. These flows are interdependent because for every one hundred migrants that move from India to the United States, there are one hundred fewer Indian migrants who can move to the United Kingdom. Methods from statistical social network analysis, such as Multiple Regression Quadratic Assignment Procedure (MR-QAP) and Exponential Random Graph Models (ERGMs), account for these dependencies and enable one to make unbiased conclusions (Desmaris and Cranmer, 2012; Krackhardt 1988; Robins et al. 2007). If we analyze data on migration flows using traditional statistical methods (e.g., OLS regression), these dependencies are likely to downwardly bias standard errors and result in false positives (Allison, 1999).

Additionally, when studying the network of international migration we need to account for endogenous, structural processes that guide the formation of ties. For example, previous work

finds that social networks tend to be characterized by transitivity (i.e., the tendency for actor *i* to send a tie to actor *k* if both actors are connected to actor *j*) and reciprocity (i.e., the tendency for ties to be mutual). If we are interested in studying processes that are exogenous to the structure of the international migration network, such as how a country's per capita GDP relates to its odds of sending migrants, then it is crucial to control for endogenous phenomena. Failing to control for structural processes downwardly biases standard errors (Block, 2015).

Furthermore, we can develop unique, theoretical insight by directly studying endogenous processes, such as transitivity and reciprocity. For instance, the network structures that result from transitivity insinuate a form of hierarchy where certain actors receive more social ties than others (Holland and Leinhardt 1976). The phenomenon of transitivity complements Paul's (2011) previous qualitative work on the stepwise migration patterns of Filipino immigrants. Paul argues that many Filipino migrants follow a hierarchy of destination countries until they are able to settle in their desired location. If the network of international migration is generally characterized by transitivity, this would suggest that the system is characterized by a complex hierarchy where countries occupy different rungs according to their desirability. On the other hand, networks defined by reciprocity are characterized by higher degrees of clustering, symmetry, and equality (Wasserman and Faust, 1994). If there are tendencies towards reciprocity in the international network of migration, this would suggest that when people born in country *a* migrate to country *b*, people born in country *b* are more likely to migrate to country *a*. However, despite the fact that reciprocity is hypothesized to define most social relationships (Block, 2015; Gouldner, 1960), theories of international migration tend to focus on the movement of individuals from countries with relatively few resources to those with many resources. As a

result, there may not exist a tendency towards reciprocity in the migration network. In fact, the network's hierarchical structure may result in an aversion to these symmetric relationships.

While some recent work has analyzed migration flows by applying a network approach, most of this research does not consider patterns of migration on a global scale. For instance, Desmarais and Cranmer (2012) apply statistical network techniques to analyze inter-state migration in the United States. They find overwhelming evidence that these migration flows are characterized by transitivity, which highlights the utility of applying a network perspective. Similarly, Lemercier and Rosental (2010) use techniques from network analysis to understand patterns of rural-urban migration in Northern France and uncover new insight about the macro-level factors that shape internal migration. The limited previous work that studies patterns of international migration with social network analysis has not utilized data on flows of migrants between individual countries, but instead relies on migrant stock data (Windzio, 2018). When migrant stock data is conceptualized as a network, a tie between country *a* and country *b* is weighted by the number of people living in country *b* who were born in country *a*. While insightful conclusions can be drawn from this data, migrant stock data does not include any information on *when* immigrants moved from their country of origin to their destination. As a result, such research prevents the testing of many hypotheses about the factors that cause international migration.

In the current project, I use social network analysis to analyze migrant flow data between 200 countries from 2010 to 2015. I specifically test whether five contemporary theories of international migration can be generalized to explain the movement of people on a global scale. Following the neoclassical model, I consider whether migration streams are more likely to develop between countries with large differences in per capita GDP (measured in USD) and

large differences in unemployment rates (following Garip, 2017). To evaluate theories of new economics, I test whether two measures of risk in sending countries – inflation rates and real interest rates – are associated with sending more migrants (following Massey and Espinosa, 1997). Furthermore, since new economics theory argues that in order for individuals to make an international move, they require a high level of capital, I test whether per capita GDP is positively associated with sending more migrants. Following segmented labor market theory, I evaluate whether the growth in countries' employment rates is positively associated with receiving more migrants (following Massey and Espinosa, 1997). To evaluate the claims of world systems theory, I simultaneously test whether growth in direct foreign investments (measures as percent of GDP) is positively associated with sending more migrants (following Garip, 2017; Massey and Espinosa, 1997). Finally, I consider social capital theory by testing whether people are more likely to move from their origin country to destination countries where a large number of people born in their origin country currently reside. I further consider the role played by social ties by testing whether more people move to destination countries when the destination country sends more remittances (in USD) to their country of origin, a presumable indicator of direct social connections.

Methods

Data

To capture global migration flows, I use data from the 2015 United Nations Population Division on the foreign-born migrant stock in 232 countries during 2010 and 2015. This dataset uses national censuses, population registries, and refugee statistics to calculate bilateral estimates on the total current stock of migrants who moved to and from different countries across the globe

(see United Nations Population Division, 2015 for more details). While migrant stock data gives an estimate of how many foreign-born individuals live in a country at a given time point, it does not tell us when they migrated to the destination country. To better conceptualize the actual movement of migrants, scholars have recently developed new methods that use an iterative proportional fitting algorithm to estimate bilateral migration flow data from two panels of migrant stock data and region-specific information on rates of birth and death (Abel, 2013; Abel 2017; Abel and Sander 2014). While these estimates are not without their limitations (see Abel 2017 for a thorough review), they have been shown to be both reliable and precise (Abel and Sander 2014). The resulting bilateral flow estimates can be configured as an n x n matrix where n is the number of countries in the sample and each (i,j) entry is the number of migrants that country i sent to country j between the two panels of stock data.

For my analytical sample, I use data on bilateral migration flows between 200 countries from 2010 and 2015 (following Abel 2017). Thirty two countries are dropped from the analytical sample because Abel's estimation technique requires birth and death rate data, which were not accurately available for all countries. I create several independent variables of interest that incorporate data on GDP per capita (in USD) (World Bank, 2018), employment rates (World Bank, 2018), inflation rates (World Bank, 2018), real interest rates (World Bank, 2018), direct foreign investments (as a percent of GDP) (World Bank, 2018), remittances (in millions of USD) (World Bank, 2016), the shortest distance between countries (in km), and population (United Nations, 2017). To help alleviate the risk of reverse causality, I create my independent variables using measures from 2010. When creating rates of change, I calculate the rate of change between 2009 and 2010.

Plan of Analysis

After conceptualizing the international flow of migrants as a social network, I use Multiple Regression Quadratic Assignment Procedure (MR-QAP) to further untangle what drives international migration flows (Borgatti, Everett, and Johnson 2013; Krachhardt 1988). Similar to OLS regression, the MR-QAP procedure allows one to model a continuous dependent variable with multiple independent variables. All variables are conceptualized as matrices, where each row and column represent a different country.

Unlike traditional statistical methods, however, the MR-QAP relaxes the assumption that all cases are independent of each other. The MR-QAP accomplishes this by comparing the observed relationship between the independent and dependent matrices to those of multiple random matrices that are known to be independent of each other a priori. To ensure that the permuted matrices are comparable to the observed matrices, each permuted matrix is created by randomly rearranging the rows of the observed matrix. As a result, the permuted matrices preserve many important properties of the observed matrix (e.g., the mean edge value, the number of edges) and enable the MR-QAP to produce unbiased statistical estimates (Krackhardt 1988). Following Borgatti, Everett, and Johnson (2013), I use 10,000 permutations for my MR-QAP models. MR-QAP coefficients can be interpreted in a similar manner to how one interprets coefficients in a regression. However, the unit of analysis is the dyad, or flow of migrants from country *a* to country *b*, not the individual country.

Independent Variables

The MR-QAP framework allows one to simultaneously test how structural processes and attribute-based processes relate to tie formation. I include several parameters to account for

structural processes, or those that are endogenous to the network of international migration. First, I include a parameter to measure tendencies towards *reciprocity*. Patterns of mutuality characterize most social networks (Block, 2015; Gouldner, 1960). When tendencies towards reciprocity are high, this suggests a type of clustering characterized by symmetry. In my MR-QAP, I construct this measure by transposing the dependent variable matrix. As a result, positive values suggest that as country *a* sends more migrants to country *b*, country *b* will send more migrants to country *a*. I also include an independent variable to account for *transitivity*, or triadic closure, in the network. Following Borgatti and colleagues (2013), the transitivity measure is a matrix where the (*i, j*) value is 1 if the shortest path between country *i* and country *j* is two or fewer steps away. If this parameter is positive it suggests that when country *a* sends migrants to country *b* and country *b* sends migrants to country *c*, country *a* is expected to send migrants to country *c*. Such a finding would suggest a tendency towards hierarchy (Holland and Leinhardt, 1971), as well as provide evidence for step-wise international migration (Paul, 2011).

To test for attribute-based processes that guide the formation of immigration flows, I include four types of variables. First, I include several *sender* parameters tests whether a country-level covariate is associated with sending more emigrants. All sender parameters are constructed as matrices where the covariate value for country *i* is imputed into every *j*th column of row *i*. For example, I construct a sender parameter for per capita GDP where the per capita GDP for country *i* is listed in every column of the *i*th row of the matrix. If the coefficient for this variable is negative, it suggests that, as the per capita GDP of a country increases, it is expected to send fewer migrants to any other countries. I also include sender parameters for the rate of inflation, real interest rate, rate of direct foreign investments, and population.

Second, I include *receiver* parameters to test whether certain covariates are associated with receiving more immigrants. I construct matrices for these parameters by assigning every *i* row in column *j* the covariate value for country *j*. For example, I include a receiver parameter for unemployment rates where the unemployment rate in country *j* is the value of every *i* row in column *j*. A positive coefficient of this parameter would suggest that when there is job growth in country *j*, country *j* is expected to receive more migrants from all other countries. I additionally include a receiver parameter for my population variable.[1]

The remaining two attribute-based parameters consider whether a characteristic of a certain dyad, or country pair, is associated with greater or smaller flows of migrants. The *difference* parameter tests whether immigrants are more likely to flow from country *a* to country *b* as the difference between country *a* and country *b*'s value on a quantitative variable of interest increases. For instance, I include a difference variable for per capita GDP where each (*i*,*j*) entry in the matrix is equal to country *j*'s per capita GDP minus country *i*'s. Positive values for this coefficient suggest that as the gap between country's GDPs increases, a migration stream is more likely to develop from the country with lower GDP per capita (country *i*) to the country with higher GDP per capita (country *j*). I also include a difference parameter for employment rates that is similarly constructed.

Finally, I include several *edge-wise* parameters that test whether a dyad-wise relation between country *a* and *b* is more likely to increase the flow of migrants between the two countries. One of the edge parameter matrices that I construct accounts for the flow of remittances between pairs of countries. Each (*i*,*j*) cell is the amount of remittances that country *i* received from county *j*. Positive values of the coefficient suggest that when country *i* receives

[1] Note that for both the sender and receiver matrices, all (*i*,*j*) entries along the diagonal (i.e., when $i = j$) are set to 0, since self-loops are not possible in my data.

more remittances from country *j*, people are more likely to migrate from country *i* to country *j*. I also include edge-wise matrices for the stock of people who were born in country *i* but live in country *j* at the start of the period of interest and for the shortest geographic distance (in kilometers) between countries *i* and *j*.

Preliminary Results

Descriptive Results:

From 2010 to 2015, the strength of migration flows between country pairs varied from 0 migrants to roughly one million and a half migrants, with the average stream containing 916 migrants (see Table 1). However, the majority of country pairs are not connected by migration streams; roughly 72% of possible migration streams consisted of 0 migrants. Additional descriptive statistics and details about the units of measurement are provided in Table 1.

To demonstrate the intricacies of the migration network, I have superimposed the network of migration flows onto a world map (see Figure 1). The width of each edge represents the amount of migrants who moved along the stream. The visualization of the network highlights a handful of popular migration streams, including the flow from Syria to Turkey, Syria to Lebanon, Mexico to the United States, India to the United States, and Bangladesh to India. Furthermore, the visualization of the network demonstrates the interconnectivity of global migration. For instance, it is clear that many countries are simultaneous receivers and senders of many migrants.

MR-QAP:

My preliminary analyses provide evidence that certain theories of international migration can be generalized to a global scale (see Table 2). The coefficient for difference in GDP per

capita is positive and significant ($b = 0.018$, $p < 0.001$), giving some support to the neoclassical economics model. For example, if a receiving country's per capita GDP is $1000 more than a sending country's per capita GDP, the sending country is expected to send an additional 18 migrants to the destination country. However, contrary to the predictions of neoclassical economics, the difference in employment rates between sending and receiving countries is not statistically significant, though it is in the expected direction ($b = 13.830$, $p = 0.398$).

Additionally, I find support for some aspects of the new economics of labor perspective. My two indicators of risk – the inflation rate of the sending country and the real interest rate of the receiving country – are not statistically significant ($b = 4.477$, $p = 0.353$; $b = -0.565$, $p = 0.720$). However, I find evidence that access to resources and capital encourage international migration on a global scale, as indicated by the positive and significant coefficient for GDP per capita of sending countries ($b = 13.157$, $p < 0.05$). [2] For each additional dollar that a country's per capita GDP is increased, it is expected to send roughly 13 additional migrants to other destination countries.

I do not find support for theories of segmented labor markets or world systems. The coefficients for past-year growth in the receiving country's employment rate and past-year growth in the sending country's rate of direct foreign investments are not significant ($b = 2.902$, $p = 0.479$; $b = -2.600$, $p = 0.520$). However, I uncover particularly strong support for social capital theory. The positive and significant coefficient for the 2010 stock matrix suggests that for every 100 people who were born in country *a* and living in country *b* during 2010, we should expect roughly five people to move from country *a* to country *b* during the time period of interest ($b = 0.051$, $p < 0.001$). Additionally, I find evidence that migrants are more likely to move to

[2] In models not shown here, I include a squared term for sending county's per capita GDP. However, I find no evidence for a curvilinear relationship.

countries that send large amounts of remittances to their country of origin ($b = 21.128$, $p < 0.001$). For example, for every one million USD country *a* remits to country *b*, country *b* is expected to send roughly 21 migrants to country *a* during the period of interest.

My coefficients for endogenous network processes are also significant, highlighting the importance of studying international migration as a social network. The coefficient for transitivity is positive and significant ($b = 324.44$, $p < 0.05$). This finding suggesting that if country *a* sends any number of migrants to country *b* and country *b* sends any amount of migrants to country *c*, country *a* is expected to send roughly 324 migrants to country *c*. I also find that there is a tendency away from reciprocity in the network of international migration ($b = -0.014$, $p < 0.01$). In other words, for every one hundred migrants who move from country *a* to country *b*, one fewer migrant is expected to move from country *b* to country *a*. Taken together, the significance of the transitivity and reciprocity coefficients suggest that the network of international migration is characterized by an ordered hierarchy where destination countries are ranked according to their desirability.

Finally, my control variables are in the expected directions. People tend to move to countries that are physically close ($b = -0.074$, $p < 0.001$), more migrants move from countries with large populations ($b = 0.004$, $p < 0.001$), and they are more likely to settle in countries with large populations ($b = 0.002$, $p < 0.05$).

Preliminary Conclusions and Next Steps

My preliminary analyses find that some theories of international migration, but not others, can be generalized on a global scale. I find moderate support the neoclassical economics model and the new economics perspective. In general, the number of migrants who move from

one country to another increases when the gap between the receiving and sending country's GDP per capita expands. This finding suggests that people tend to move from countries with relatively few resources to those with many resources, a phenomenon implied by the neoclassical economics perspective (Harris and Todaro, 1970). As suggested by theories of the new economics of labor, migration requires a certain amount of economic resources and capital (Katz and Stark, 1986). In my analyses, I find that countries with high GDP's per capita are more likely to send emigrants.

I find the most support for social capital theories of migration. Migrants are more likely to move to countries where large numbers of co-nationals already reside. They are also more likely to move to destinations from which their origin country receives large amounts of remittances. Taken together, these findings suggest that social ties play an important role in explaining the patterns of the international migration network. Complementing the logic of cumulative causation (Massey and España, 1987), my analyses suggest that international migration is often self-perpetuating, regardless of economic factors. Finally, I do not find support for segmented labor market theory or the world systems perspective. However, it is important to note that even though these theories cannot be generalized to explain patterns of migration on a global scale, they are likely to provide insight on the migration flows between certain countries, or for migrants with certain demographic characteristics.

As discussed previously, there are many benefits of the MR-QAP framework. However, the method is not without its shortcomings. While some endogenous processes, such as reciprocity and transitivity, can be accounted for in MR-QAP models, it is not possible to account for other structural processes, such as the tendency to find popular hubs or cycles in the network. Relatively novel methods for the statistical analysis of networks have been developed

to better control for these processes, including the Generalized Exponential Graph Model (GERGM) (Desmarais and Cranmer, 2012). As I continue to work on this project, I plan to model my data on global migration flows using GERGMs so I can better measure and account for a variety of endogenous structural phenomena.

Looking forward, I also plan to include more controls in my analyses, which are likely to also shape individual's decisions to move internationally. For example, I plan to control for migrants' tendencies to move between places that speak the same language, share similar religious backgrounds, and are located in the same regions of the world. Additionally, I plan to control for the tendency for migrants to move from former colonies to their former colonial powers, for acts of war, violence, political unrest, and natural disasters to encourage out-migration, and for strict migration policies to deter in-migration. Finally, I will introduce controls for other demographic factors that may also shape migration patterns, such as the age structure of receiving countries and fertility patterns of sending countries.

Overall, I believe that we can develop new insights about the processes that drive international migration by modeling and analyzing the process as a social network. Novel methods from statistical network analysis enhance our ability to test the generalizability of contemporary theories of international migration. Furthermore, social network analysis enable us to consider how endogenous forces shape the phenomenon, such as tendencies towards transitivity and away from reciprocity.

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Table 1. Descriptive statistics at the level of the individual country and dyad

	Mean	Standard Deviation	Minimum	Maximum
*Dyad-Level (*n *=39,800)*				
2010-2015 Migrant Flow	916.05	15,042.51	0	1,518,110
2010 Migrant Stock	5,302.27	84,743.41	0	11,566,960
2010 Remittances (in millions, USD)	11.19	205.92	0	21,693
Shortest Distance (in km)	7,005.60	4,434.92	0	19,147.90
*Individual-Level (*n *=200)*				
2010 GDP per capita (USD)	12,780.20	17.891.20	89	104,772
2010 Unemployment Rate (%)	8.59	6.07	0.35	32.02
Rate of Employment Growth 2009-2010 (%)	0.06	2.61	-5.27	30.36
Inflation Rate of Change 2009-2010 (%)	0.33	4.303	-34.16	10.78
Real Interest Rate of Change 2009-2010 (%)	4.13	8.22	-42.31	29.58
Direct foreign investments rate of change 2009-2010 (% of GDP)	1.22	8.67	-18.93	88.85
2010 population (in thousands)	34,670.21	133,748	91	1,359,755

Table 2. Multiple regression quadratic assignment procedure (MR-QAP) of 2010-2015 global migration flows

	Coefficient	Standard Error	
Attribute-Based Processes			
Difference in GDP per capita	0.018	(0.003)	***
Difference in unemployment rates	13.830	(16.335)	
Inflation sender	4.477	(5.503)	
Interest sender	-0.565	(1.618)	
GDP per capita sender	13.157	(4.875)	*
Employment growth receiver	2.902	(6.604)	
Foreign investment sender	-2.600	(4.922)	
2010 Migrant Stock	0.051	(0.001)	***
Remittances	21.128	(0.367)	***
Structural Processes			
Reciprocity	-0.013	(0.004)	**
Transitivity	324.436	(146.998)	*
Controls			
Shortest distance	-0.074	(0.013)	***
Population sender	0.004	(0.000)	***
Population receiver	0.002	(0.000)	*
Intercept	281.741	(173.41)	
R^2	0.607		

Note: *p < 0.05, **p < 0.01, ***p< 0.001. MR-QAP relies on 10,000 iterations.

Figure 1. Map of global migration flows from 2010 to 2015

Note: Edges are weighted according to the number of migrants. For the purpose of visualization, only flows of 1,000 or more migrants have been plotted.